

Appln. Serial No. 10/544,270
Reply to Office Action Mailed August 6, 2008

REMARKS

In the Office Action dated August 6, 2008, claims 35, 73, and 77 were objected to and rejected under 35 U.S.C. § 112, second paragraph. Claims 1 and 39 were rejected under 35 U.S.C. § 102(e) as being anticipated by Waagaard (U.S. 7,019,837). Claims 4-6, 10-12, 14-16, 19-22, 26, 28-30, 36, 42-44, 48-50, 52-54, 57-60, 64, 66-70, 72, and 74 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Waagaard in view of Prohaska (U.S. 6,208,776). Claim 71 was rejected under 35 U.S.C. § 103(a) as being unpatentable over Waagaard in view of Prohaska and further in view of Hodgson (U.S. 6,269,198). Claims 2 and 40 were indicated to be allowable if rewritten in independent form.

In this Reply, claims 35, 73, and 77 have been canceled, without prejudice; claims 2 and 40 have been amended to place them in independent form; and claim 64 has been amended to correct a dependency. Accordingly, claims 1-2, 4-6, 10-12, 14-16, 19-22, 26, 28-30, 36, 39-40, 42-44, 48-50, 52-54, 57-60, 64, 66-72 and 74 are currently pending.

Objection to and Rejection of claims 35, 73 and 77.

Claims 35, 73 and 77 have been canceled, without prejudice, to advance the allowance of this case. Thus, the objection and rejections of those claims have been rendered moot.

Rejection Under 35 U.S.C. 102.

The rejection of claims 1 and 39 under 35 U.S.C. 102(e) as being anticipated by Waagaard is respectfully traversed. Claim 1 recites a method of launching optical pulses at a plurality of wavelengths into a fiber having reflectors that form an array of sensor elements, detecting a returned optical interference signal for each of the wavelengths, determining the absolute optical path length between two reflectors from the interference signal, and determining the value of a selected parameter from the determined absolute optical path length.

As explained in the specification of the present application, determination of the absolute optical path length between reflectors is challenging because interferometric sensors provide a periodic response to the measurand. A large number of these periods (referred to as fringes) exist in a typical optical path length, making it difficult to determine on which fringe the sensor is actually located. In other words, with respect to an absolute optical path length,

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interferometric sensors return an ambiguous response. Thus, in order to determine the absolute optical path length, the fringe order ambiguity must be resolved over a large number of fringes. See Specification at pp. 3-5. An apparatus and technique for doing so is disclosed and claimed in the present application, the implementation of which includes launching pulses at a plurality of wavelengths and detecting a returned interference signal for each of those wavelengths.

In contrast to the method recited in claim 1, Waagaard does not teach---or even contemplate---determining the absolute optical path length between reflectors or determining the value of a parameter from the absolute optical path length. Rather, Waagaard discloses only determining the phase delay response between pairs of reflectors at a single wavelength for that group of reflectors. See, e.g., Waagard, 3:34-56. While a relationship does exist between phase and absolute optical path length, Waagaard does not disclose any technique by which the ambiguities of an interferometric sensor's response can be resolved such that the absolute optical path length can be determined. Indeed, it is not at all apparent that an absolute optical path length could be determined from Waagaard's technique for detecting a phase response as Waagaard does nothing more than measure each group of sensor's phase response to a *single* optical wavelength that has been selected for that group. Thus, it is respectfully submitted that Waagaard does not disclose determining either the absolute optical path length between reflectors or determining the value of a parameter from the determined length, as recited in claim 1.

Waagard is similarly deficient with respect to independent claim 39. Claim 39 recites an apparatus comprising an optical fiber having reflectors; signal detection means to detect a returned optical interference signal for each of a plurality of preselected wavelengths of optical pulses launched into the fiber; and signal processing means to determine the absolute optical path length between reflectors from the returned signal. The signal processing means also determines the value of a selected parameter from the determined absolute optical path length.

For the reasons discussed above, Waagaard does not disclose any technique by which the absolute optical path length between reflectors can be determined from its phase response measurement or determining the value of a parameter from the determined absolute path length. Thus, Waagaard does not disclose all of the limitations recited in claim 39.

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In view of the foregoing, Waagaard does not anticipate claims 1 and 39, or any of the claims that are variously based on claims 1 and 39. Accordingly, withdrawal of the rejection in view of Waagaard and reconsideration of claims 1 and 39 are respectfully requested.

Rejections under 35 U.S.C. 103

With respect to dependent claims 4-6, 10-12, 14-16, 19, 22, 26, 28-30, 36, 42-44, 48-50, 52-54, 57-60, 64, 66-70, 72 and 74, each of those claims are based on either claim 1 or claim 39. Those claims have been rejected in view of Waagaard in a hypothetical combination with Prohaska. In addition, claim 71, which is based on claim 39, has been rejected in view of Waagaard in a hypothetical combination with Prohaska and Hodgson. Those rejections are respectfully traversed.

The deficiencies of Waagaard with respect to claims 1 and 39 have been discussed above. Neither Prohaska nor Hodgson compensates for those deficiencies. In Prohaska, each sensor in the array reflects at a different wavelength. A wavelength division multiplexer in a detection system associates a pair of light reflections with a particular sensor on the basis of the wavelength of the reflection. A detection circuit determines the spectral separation between the two reflections from a selected sensor in order to determine the value of a sensed parameter. Accordingly, Prohaska, like Waagaard, does not teach or suggest determining an absolute optical path length between reflectors from a returned interference signal, or determining the value of a parameter from the determined absolute optical path length.

With respect to Hodgson, it discloses an acoustic sensing system in which optical signals from the sensors are demodulated and processed to obtain the polar phase which corresponds to the phase difference between the optical beams in a test and reference arm. Again, although phase is detected, Hodgson does not disclose any manner in which absolute optical path length between pairs of reflectors can be determined from the detected phase difference. Accordingly, Hodgson also does not compensate for Waagaard and Prohaska's deficiencies with respect to independent claims 1 and 39.

In view of the foregoing, it is submitted that none of the proposed combinations of references teaches or suggests all of the elements recited in any of the claims which depend from

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independent claims 1 and 39. Accordingly, withdrawal of the rejections and reconsideration of the dependent claims are respectfully requested.

Indication of Allowability of Claims 2 and 40

The examiner is thanked for indicating the allowability of claims 2 and 40 if rewritten in independent form. In accordance with that indication, claims 2 and 40 have been amended to include all of the limitations of claims 1 and 39, respectively. In view of this amendment, it is believed that claims 2 and 40 are in condition for allowance. Accordingly, withdrawal of the objection is respectfully requested.

CONCLUSION

In view of the foregoing, Applicant respectfully requests withdrawal of the objections and rejections, reconsideration of the pending claims, and a favorable action in the form of a Notice of Allowance. Should the examiner believe that a telephonic interview would help speed the application toward allowance, the examiner is invited to contact the undersigned at the number below.

The Commissioner is authorized to charge any additional fees or credit any overpayment to Deposit Account No. 20-1504 (SHL.0434US).

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Respectfully submitted,

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